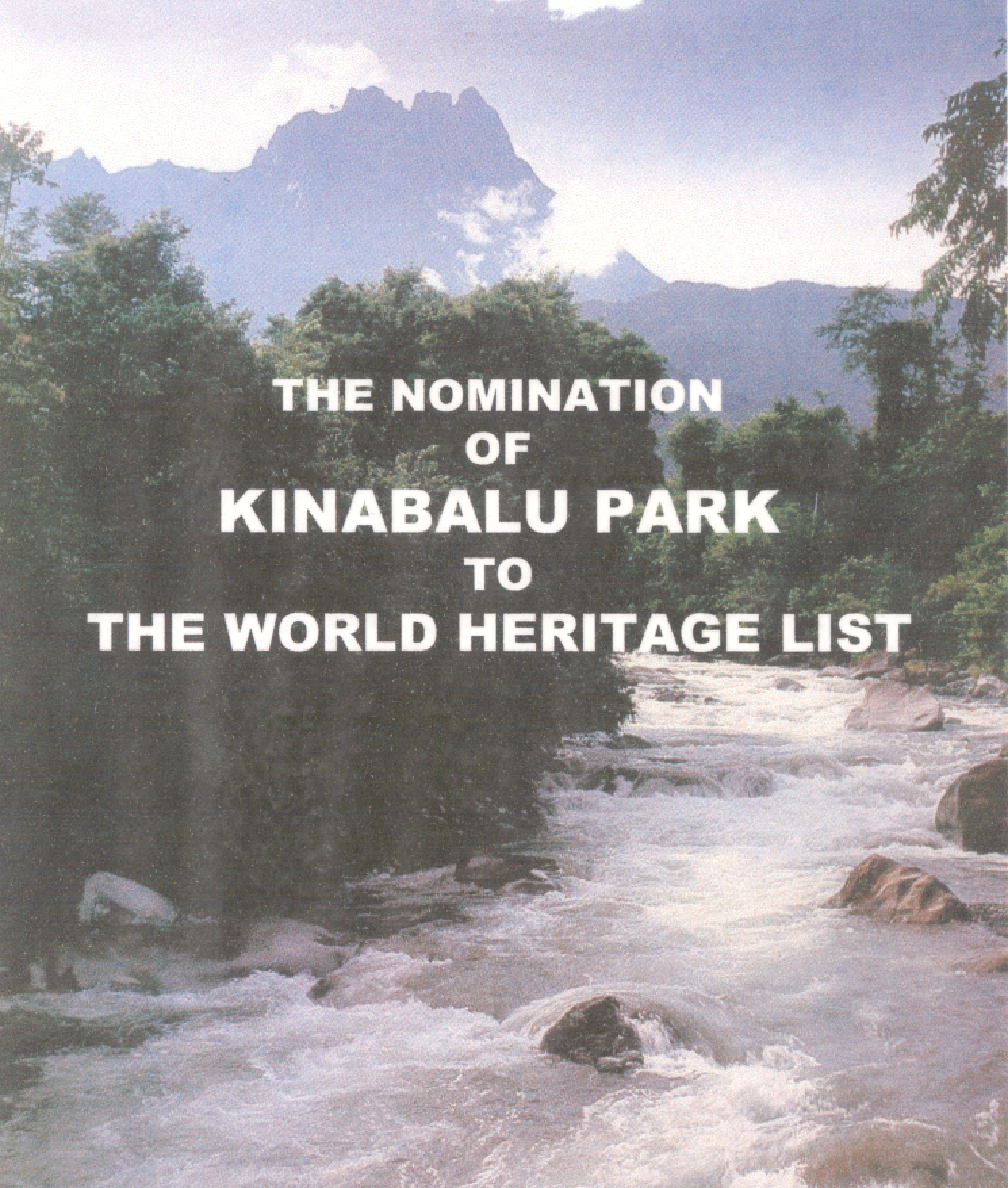


# THE NOMINATION OF KINABALU PARK TO THE WORLD HERITAGE LIST

# 2. Justification for Inscription

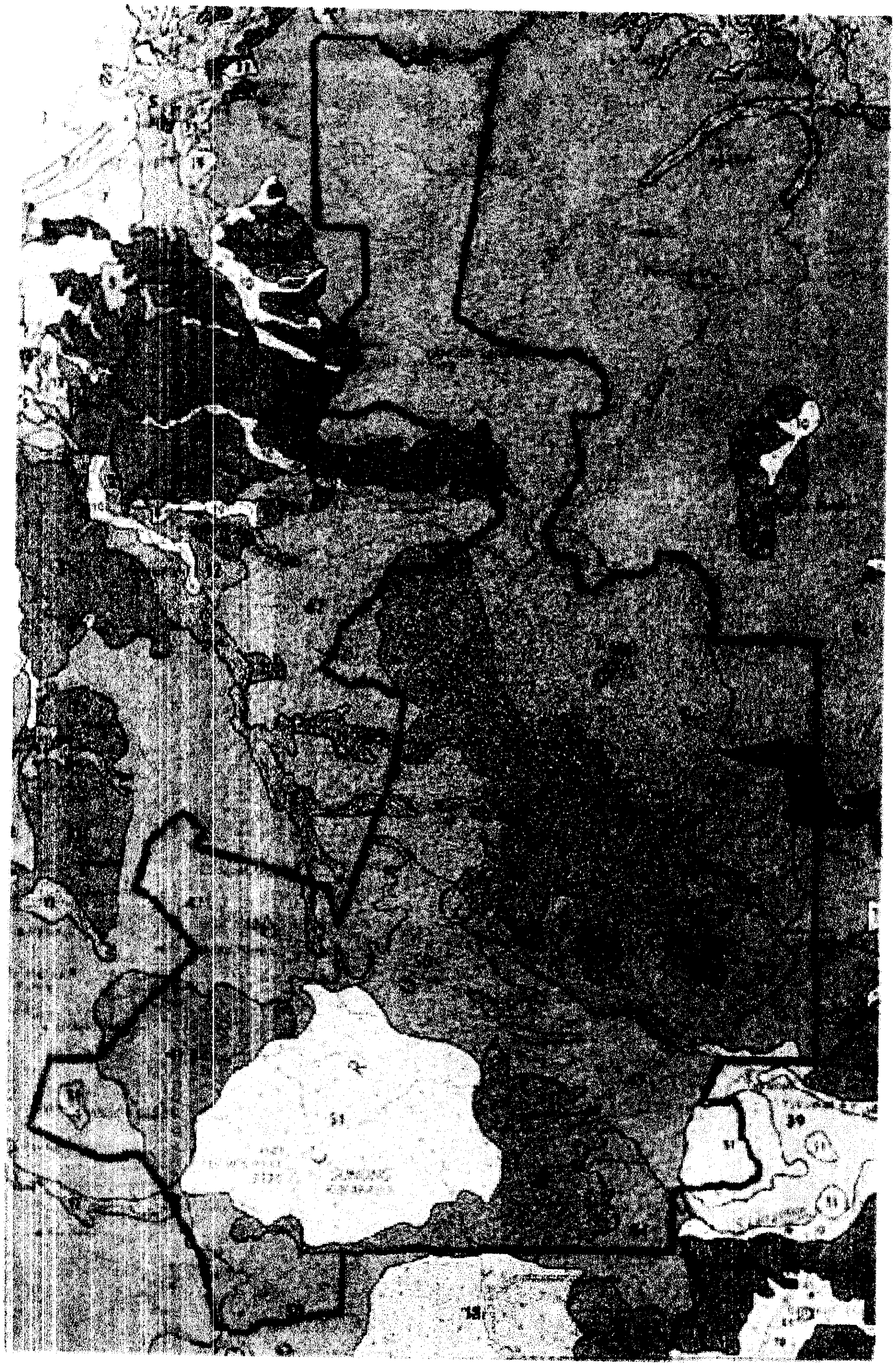
## A. Statement of significance

Kinabalu Park possesses several criteria which merit the area to be listed as a World Heritage Site. The criterion which Kinabalu Park certainly qualifies is that it serves as an important "natural habitats for *in situ* conservation of biological diversity" (described in detail on 2.d). Kinabalu has evidences of past glacial action, has example of significant on-going ecological and biological processes in the evolution and development of terrestrial habitat, and possesses exceptional natural beauty.

The mountain has the evidences of past glacial action which are still preserved. Koopmans and Stauffer (1967), who carried out a detailed study of the summit area, first documented the evidence of Pleistocene glaciation on Mount Kinabalu ( Jacobson, 1970). The researchers described that the summit area supported an ice-cap of 5 sq. km in extent. This ice-cap fed a steep valley glacier which flowed to the north down Low's Gully. The features of this glacial action are preserved. For instance, they maintained the existence of two terminal moraines, a vegetated hummocky area 2890 m in Low's Gully, based on inference from photo-interpretation although they have not been confirmed by field evidence. They also found valleys with U-shaped cross sections between Alexandra Peak and Victoria Peak, five cirques - one between North Peak and King George Peak, and four between Low's Peak and King George, and surface markings such as striations and grooves best exposed on the slopes above Sayat-Sayat. Other researchers such as Komoo (1997) described the Kinabalu plateau as representing "a unique morphology that is different from other elevated plateaus in the wet tropics." The features found on the mountain such as U-shaped gullies and valleys, hanging valleys, cirques, polished surfaces, crescentic gouges and fractures, plucking, grooves and striations, and *roch moutonnees* are "evidences of an ancient (35,000 to 3,000 years) ice sheets that once covered the peak of Mount Kinabalu." The aforesaid features of Kinabalu Park might fulfill the criterion of "be outstanding examples representing major stages of earth's history on significant geomorphic or physiographic features."

The extent of Kinabalu Park covers elevation from 152 meters around the upper eastern boundary at Marak Parak to 4,095 meters at Low's Peak. Aside from this range of elevation, the presence of several types of rocks such as ultrabasic intrusive rocks, granite rocks and sedimentary rocks (Jacobson, 1967) formed as parent materials for eight types of soil associations, such as Brantian (key 12), Dalit (key 31), Lokan (key 39) Bidu-Bidu (key 41), Malubok (key 44), Crocker (key 47), Trusmadi (key 50), and Kinabalu (key 51) found within Kinabalu Park (Soil of Sabah - Soil sheet NB50-6 of 1974) {**Map 2**}. Four categories of soils

Map 2



| Key | Association | Landform | Parent materials | Main soil units |
|---|---|---|---|---|
| 12 | Brantian | Terraces | Alluvium | Orthic, Ferric and Gleyic Acrisols; Gleyic Podzol |
| 31 | Dalit | Moderate hills and minor valley floors: slopes 0-20° | Sandstone, mudstone and alluvium | Orthic, Ferric and Gleyic Acrisols |
| 39 | Lokan | Very high hills: slopes >25° | Sandstone and mudstone | Orthic Acrisol; Dystric Cambisol |
| 41 | Bidu-Bidu | Mountains and hills | Ultrabasic igneous rocks | Rhodic and Orthic Ferralsols; Eutric Cambisol; Chromic and Orthic Luvisols; Lithosol |
| 44 | Malubok | Mountains | Igneous rocks, sandstone, mudstone and chert | As for Associations 41, 42 and 47 with Chromic Cambisols and Lithosols on chert |
| 47 | Crocker | Mountains | Sandstone and mudstone | Orthic Acrisol; Chromic and Dystric Cambisols; Lithosol |
| 50 | Trusmadi | Mountains above 1200 m a.s.l. | Sandstone | Gleyic and Orthic Acrisols; Gleyic Podzol; Humic Gleysol; Dystric Histosol; Lithosol |
| 51 | Kinabalu | Mountains above 2400 m a.s.l. | Acid igneous rocks | Humic Cambisol; Dystric Histosol; Lithosol |

**Source: The Soils of Sabah (Soil Sheet: TUARAN NB 50-6, 1974)**

*Reproduced with permission from the Director of National Mapping, Malaysia* (DPNM/J3 CPP/2002 dt. 8 June 1999) classifications based on vegetation zones are found in Kinabalu Park namely, mull humus, mor humus, anaerobic soils, and mull-like soils (Anon, 1992). Thus, Kinabalu Park has outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial habitat.

Kinabalu Park also possesses the criterion of exceptional natural beauty. Anon (1992) listed at least four zones of outstanding natural and scenic values namely, the granitic outcrop, the waterfalls, the hot springs, and the summit trail. The granitic outcrops of Mt. Kinabalu comprise of natural values of outstanding natural scenery (montane, submontane and peaks), montane vegetation and geological forms, while the waterfalls exhibit principal natural values such as outstanding natural scenery and tropical rain forest. The hot springs possess natural value in the form of unique underground geothermal springs, and the summit trail has principal natural values comprising of outstanding natural sceneries, altitudinal changes of vegetation types and geological formations.

## B. Possible comparative analysis (including state of conservation of similar site)

In terms of floral diversity, Kinabalu Park contains "one of the most diverse if not the most diverse flora in the world" (Beaman & Beaman, 1998). This latest finding discloses that "the Kinabalu flora may include as many as 5,000 – 6,000 species" (Beaman & Beaman, 1998) as opposed to nearly 4,000 species stated previously (Beaman, 1996). This figure surpasses the 3,000 species of plants found in Sangay National Park, a world heritage site inscribed in 1983 (http:/www.unesco.org/whc/sites/260.htm).

On avifauna, there are now 326 species of birds recorded within Kinabalu Park (Biun, 1998). This figure is higher than the 270 species recorded in the Central Eastern Rainforest Reserve of Australia, also a world heritage (http:/www.wcmc.org.uk:80/protected_areas/data/wh/cerr.html), but lower than the figure (more than 450 species) recorded in Los Katios National Park.

On altitudinal vegetation zones, Kinabalu Park exceeded Lorentz National Park of Indonesia by having six vegetation zones compared to five found within the latter.

## C. Authenticity/Integrity

The vegetation of Kinabalu Park comprises primarily natural forest. Kitayama (1991) reveals that "natural vegetation covers 93.5 percent of the park, while substituted vegetation (anthropogenic disturbance) accounts for 6.5 percent." The tropical lowland forest and the tropical (lower and upper) montane forest dominate the natural vegetation, and are found between Mount Kinabalu and Mount Tambuyukon. The substituted vegetation occurs largely around Mount Templer, and mostly in "old, secondary forest selectively logged before designated as a park."

Exotic floral species occur at Kinabalu Park with concentration at the Kinabalu Park Headquarters (PHQ) either along the river or in the Mountain Garden. Out of some 30 species, two thirds of them fall into the horticultural category while the rest are trees. Some of the common exotic trees are *Pinus caribaea*, *Acacia manguim* and *Araucaria spp*.

Kinabalu Park, established under the National Parks Ordinance, 1962, is a State property managed and administered by The Board of Trustees of the Sabah Parks, a statutory body under the Ministry of Tourism Development, Environment, Science and Technology. As the Park falls under the concurrent list, both the State Government and the Federal Government have jurisdiction over the area. The gazetted plan of Kinabalu Park is 99197385 {Sec.17(1) Parks Enactment, 1984}.

Under the Parks Enactment, 1984 (**Appendix 1**), Kinabalu Park is vested in the Board of Trustees of the Sabah Parks for an estate in leasehold for a period of 999 years free from all liabilities and encumbrances.

## D. Criteria under which inscription is proposed (and justification for inscription under these criteria)

The criterion that Kinabalu Park certainly qualifies is "containing the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation." This proposal intends to inscribe Kinabalu Park under this criterion especially on floral aspect.

Mount Kinabalu is considered as a convergent point where the Himalayan and Chinese genera meet with those of Australian, New Zealand and even American affinity (Corner, as revised by Beaman, 1996; Ghazally Ismail & Lamri Ali, 1996). In terms of plant diversity, Mt. Kinabalu is reputed to be one of the richest areas in the world (Ghazally Ismail & Lamri Ali, 1996). Corner (as revised by Beaman, 1996) believed that the mountain contains "the richest and most remarkable assemblage of plants in the world." In an area of approximately 700 sq. km some 4,000 species of vascular plants occur at different altitudinal zones (Beaman, 1996). In their latest finding, Beaman & Beaman (1998) reveal that the area may contain as many as 5,000 – 6,000 floral species. Some 608 species of ferns have been recorded in the Park, more than the whole mainland of tropical Africa (Holttum, as cited by Ghazally Ismail and Lamri Ali, 1996).

The flora of Kinabalu indicates a high degree of endemism. For instance, more than half (78 species) of the 135 species of *Ficus* occurring in Borneo can be found in the Park. Of this figure, 14 species are endemic and 5 endemic varieties of other fig species. This makes Kinabalu Park one of the richest areas for figs in the world (Corner as revised by Beaman, 1996). Some 9 species of the insectivorous plants *Nepenthes* occur in the Park of which 4 species are endemic to Kinabalu Park. There are about 1000 species of orchids in 121 genera or 30 percent of all orchids species in Borneo (Lamb, 1996). The famous Slipper Orchids of the genus *Paphiopedilum* are represented by at least 5 species in the Park including *P. rothschildianum* which is endemic.

# 3. Description

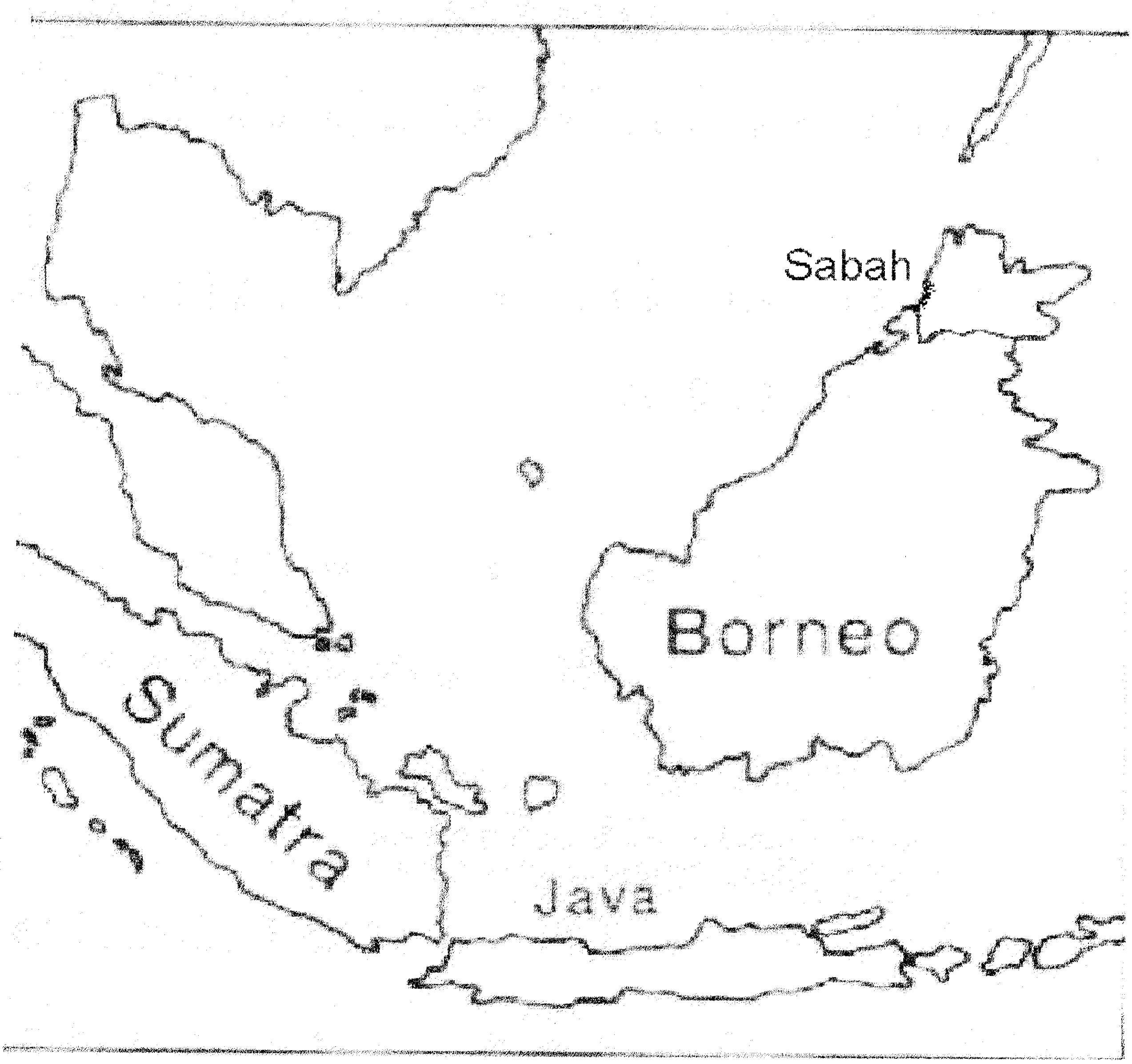
## A. Description of the Property

### 1. Physical Area

Kinabalu Park is located within the State of Sabah (**Map 3a**), Malaysia, on the northern part of Borneo (**Map 3**). The Park comprises of three main mountains, from the south to northward, Kinabalu (4,095 m), Tambuyukon (2,579 m), Templer (1133 m). A long-ranging sharp ridge called the "north ridge" connects these non-volcanic mountains. The park is about 83 km by road or about 2-hour drive from Kota Kinabalu, the capital of Sabah. Currently, the park has three main destinations, namely PHQ (1,560 m asl) on the southern boundary, Poring Hot Springs (PHS) (550 m asl) on the eastern boundary, and the newly established Mesilau Nature Resort (~2,000 m asl) also on the southern boundary. Two ranger's stations had been established at Sayap and Sorinsim on the western and eastern boundary respectively.

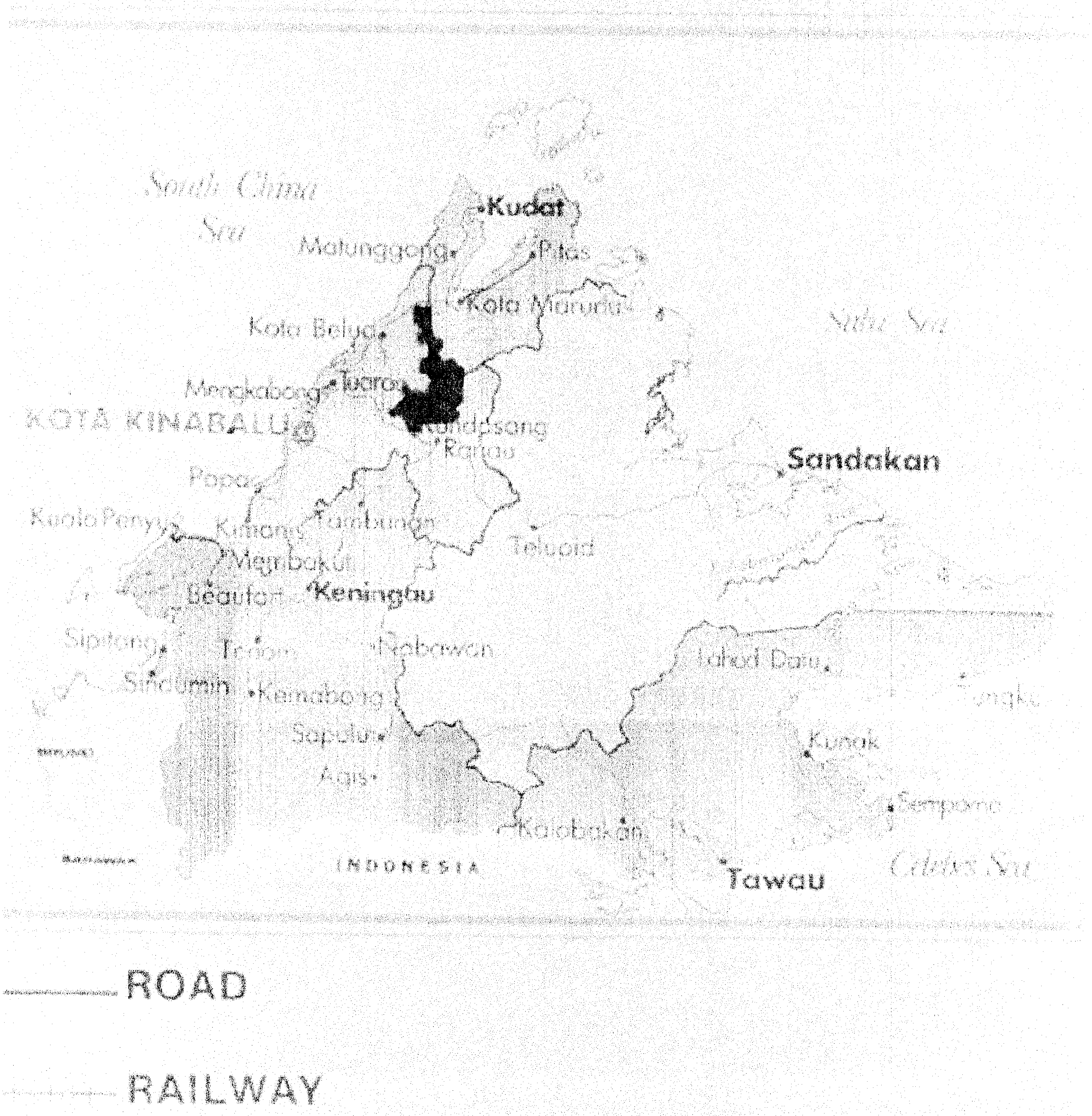
The boundary of Kinabalu Park had been properly surveyed. Survey work was completed in April, 1998. The boundaries are well marked with boundary stones and pegs. Trees along the boundary had been painted red, and park logo fixed at certain intervals. Draft plan of the surveyed park boundaries appears on **Appendix 2**.

## Map 3: Map of South East Asia



## Map: 3a

# MAP OF SABAH



## 2. Climate

Kinabalu Park, especially the mountain, has a humid tropical climate. Kitayama (1992) described the climate as follow: The mean monthly air temperature at PHQ is *c.* 20 °C with a daily fluctuation of 7 – 9 °C. The annual TMAX and TMIN (1975 – 83) at 1,860 m are 22.2 °C and 14.4 °C respectively. The year to year rainfall fluctuates greatly at PHQ ranging from 2,000 to 3,800 mm (1975- 83). Kitayama et al. (1999) further monitored the climatic conditions from 1996 to 1997 at four stations within Kinabalu Park and recorded as follows: The mean air temperature is 18.3 °C at PHQ, 24.3 °C at PHS, 11.9 °C at Carson Camp helipad (2,650 m asl), and 9.5 °C at Laban Rata (3,270 m asl). The mean yearly rainfall is 2,380 mm at PHQ, 2,392 mm at PHS, 2,256 mm at Carson Camp helipad, and 2,839 mm at Laban Rata.

## 3. Biological Resources

The documentation of the flora of Kinabalu Park began in 1894 when O. Stapf made an account entitled "On the Flora of Mount Kinabalu in North Borneo." Since then many studies had been conducted notably by Corner (1962a, 1962b, 1963, 1964, 1966, 1969, 1970, 1976), Corner and Watanabe (1969), Beaman & Beaman (1990, 1998), Parris et al.(1992), and Wood et al. (1993). Professor John Corner, an eminent Cambridge scientist, describes Kinabalu Park as a convergent point for the Himalayan, Chinese, Australian, New Zealand and even American affinity. The flora mingle at all altitude with most of the Malaysian upsurgents begin to disappear above 1200 m., and many new genera unfamiliar to the lowland begin to enter. Examples include the buttercups (*Ranunculus*) of Australian affinity, the climbing madder (*Rubiacae*) of European affinity, the Rosaceous trees and shrubs of Sino-Himalayan affinity and *Gunnera* of the Southern Hemisphere together with the pitcher plants (*Nepenthes*) of the Borneon affinity continue to thrive. Corner believed that the mountain contains "the richest and most remarkable assemblage of plants in the world." A new enumeration of the flora by Beaman (1996) reveals that nearly 4,000 species of vascular plants have been collected within the approximately 700 sq. km of Mt. Kinabalu." He added that "over 180 plants families and 950 genera occur in the flora." However, in their latest finding, Beaman & Beaman (1998) disclose that Kinabalu flora may contain "as many as 5,000 – 6,000 species," and "over 200 families and 1,000 genera occur on the flora." Studies on the flora show that there are about 1,000 orchid species in 121 genera including the famous slipper orchid *Paphiopedilum rothschildianum* (Lamb, 1996), 608 ferns species (Holttum, 1996), 9 *Nepenthes* species of which 3 species, namely *N. burbidgeae, N. rajah* and *N. villosa* are endemic to Kinabalu (Corner, 1978 as revised by Beaman, 1996), 24 *Rhododendron* species of which 5 species namely *R. ericoides, R. buxifolium, R. fallacinum, R. stenophyllum* and *R. abietifolium* are endemic to Kinabalu (Argent, 1996), 78 *Ficus* species of which 13 are endemic species and 5 endemic varieties of other species (Corner, 1962 as revised by Beaman, 1996) 30 ginger species (Smith, 1996), 6 bamboo species (Wong & Dransfield, 1996), 52 palm species (Dransfield, 1996), and two *Rafflesia* sp. namely *R. pricei* and *R.keithii* (Mat Salleh, 1996).

The boundaries of Kinabalu Park range from an elevation of 152 m around the upper eastern boundary at Marak Parak to 4,095 m at Low's Peak. The Park supports six main vegetation zones readily identified based on forest structure and species composition. The zones classified according to latitude are Lower Mountain Forest (1200 - 1900 m), Upper Mountain Forest (1900 - 2700 m), Ultrabasic Rock Forest (2700 - 3000 m), Lower Granite Boulder Forest (3000 - 3300 m), Upper Granite Boulder Forest (3000 - 3800 m) and Summit or Subalpine (3200 - 4095 m). The classification of vegetation by Kitayama (1991), based on communities provides a list of 18 types of natural vegetation and 3 types of substituted vegetation (refer **Appendix 3**). The natural vegetation communities are: tropical lowland rain forest, tropical montane rain forest, tropical subalpine coniferous forest, ecotone communities, tropical alpine ericaceous thicket, tropical alpine dwarf-shrub heath, plant communities in rocky desert, leptophyllous closed forest, leptophyllous shrubland, matted dwarf-shrub thicket, microplyllous closed forest, lepto-nanophyllous thicket, leptophyllous thicket, graminoids, plants communities on cliff, secondary closed forest, evergreen suffruticose thicket, and natural bareland or moss flush. The substituted vegetation are secondary forest, weed, and artificial bareland. Kitayama (1991) concluded that natural vegetation accounts for 93.5 percent, while substituted vegetation consists of 6.5 percent.

The faunal diversity within Kinabalu Park had also been studied. Payne (1996) revealed that at least 90 species of lowland mammals, including 21 species are bats, and 22 species of montane mammals have been recorded. About 306 species of birds are found within Kinabalu Park (Jenkins & de Silva, revised by Wells & Phillips, 1996) and can be categorized into four groups: (i) subalpine zone species; (ii) endemic montane species; (iii) non-endemic montane species; and (iv) lowland species. Four species of birds are found on the subalpine zone, while 46 species occur in the montane zone, of which 14 species are endemic to Borneo (Smythies, 1996). A study by Biun (1999) disclosed that a total of 326 bird species in 180 gegera and 47 families have now been recorded within Kinabalu Park. Nine families of fishes have been recorded in the Park (Chin, 1996). The most common fishes found on the clear mountain stream are the *Gastromyazontidae*. The species list of frogs and toads are now about 61 species (Inger et al., 1996). About 200 butterflies species have been recorded and are found mostly below 2000 m on Kinabalu, and about 112 'macro' moth species commonest at 2000 m and above (Holloway, 1996). The beetle fauna of Kinabalu is numerous and diverse with 8 families, and 2 subfamilies. The family Scarabaeidae has the highest number of species (over 100) found within the Park. Species lists appear on **Appendix 4**.

## 4. Physical Resources

Six major topographical features can be found within Kinabalu Park. They are (a) **Peaks and plateau**: the summit plateau and peak of lower mountains which include South Peak, St John's Peak, Ugly Sister Peaks, and No name Peak; (b) **Gullies**: the presence of a spur which runs in a northeasterly direction from the eastern end of the Kinabalu summit, which is less than 3.2 km long culminating in a long, narrow and jagged ridge at approximately 3,500 m. This spur encloses a deep cleft known as Low's Gully; (c) **Rivers, streams and waterfalls**: Mt. Kinabalu is the source of many important rivers in Sabah flowing eastward and southward direction. The better known waterfalls are Cascade waterfall and Liwagu Fall; (d) **Hot springs**: located at Poring and it contains sulphur which has health and curative properties; (e) **Caves**: the Paka Cave at 3,192 m and the tumbled bats cave at Poring; and (f) **Granitic slabs**: a characteristic of the slopes of the summit zone.

The geological and ecological patterns of Mount Kinabalu seen today were the result of geological processes (volcanic, tectonic and ecstatic). Some 1.5 million years ago, granodiorite from deep below the earth's surfaced forced its way upwards through the overlying rock-crust, sandstone and shales to form the mountain. The summit zone of Kinabalu is the consequence of a rapid uplift of granodiorite pluton, and during the Ice Age the glacier sculptured the smooth mountain to what can be witnessed today. Evidences of these past events are preserved in the form of polished surfaces and moraines, cirques, grooves striations and scratches of the rocks.

Four main categories of soils, based on the main vegetation zones, are found in the Park. At the Lowland Forest Zone (below 1000 m), the organic matter is well mixed into the soil profile resulting in a mull humus. It is reddish brown (10 YR5/8 when dry-Munsell) at 60 cm with some evidence of mottling. The pH of the soil at both profiles range from 3.5 - 5.4; there is a decrease in concentration of metal cations such as Na+, K+, Mg+ + and especially Ca+ + with depth. At the Lower Montane Forest Zone (1000-1800 m), the general feature of soils is the accumulation of organic soil, and characterised with thick mor humus at 1600 m. Beneath this humus layer, a pale A horizon and a thin (1 cm) dark brown B horizon are found. At around 1600 m the soil is podzolic and more acidic than at 1000 m. At the Upper Montane Zone (1800 - 3200 m), anaerobic soils and a built-up of peat are present due to the extreme wetness of this zone. The soils change from peat to mull humus, and the pH ranges from 3.5 to 4.5. On the Summit or Subalpine zone (3200 - 4095 m), the soil between 3150 - 3300 m becomes very thin, and on the sheltered part of the summit, mull-like soils are found on the granodiorite.